1. A semiconductor nanocrystal compound capable of linking to one or more affinity molecules and capable of, in response to exposure to a first energy, providing a second energy, said semiconductor nanocrystal compound comprising:

a) one or more semiconductor nanocrystals, each capable of, in response to exposure to said first energy, providing said second energy; and

b) one or more linking agents, at least a portion of which said linking agents are linked to said one or more semiconductor nanocrystals.

2. The semiconductor nanocrystal compound of claim 1 wherein said one or more semiconductor nanocrystals in said compound are capable of receiving said first energy by fluorescence resonance energy transfer (FRET).

3. The semiconductor nanocrystal compound of claim 1 wherein said one or more semiconductor nanocrystals in said compound are capable of providing said second energy by fluorescence resonance energy transfer (FRET).

4. The semiconductor nanocrystal compound of claim 1 wherein said one or more semiconductor nanocrystals in said compound are capable of receiving said first energy by exposure to radiation.

5. The semiconductor nanocrystal compound of claim 4 wherein each of said one or more semiconductor nanocrystals is capable of absorbing said radiation over a wide bandwidth.

6. The semiconductor nanocrystal compound of claim 1 wherein said second energy results from diffraction and/or scattering of said first energy by at least one of said one or more semiconductor nanocrystals.

7. The semiconductor nanocrystal compound of claim 1 wherein said second energy results from absorption of said first energy by at least one of said one or more semiconductor nanocrystals.

8. The semiconductor nanocrystal compound of claim 1 wherein said one or more semiconductor nanocrystals in said compound are capable of providing said second energy as electromagnetic radiation emitted by said semiconductor nanocrystals.

9. The semiconductor nanocrystal compound of claim 1 wherein each of said one or more linking agents is capable of linking to said one or more affinity molecules.

10. The semiconductor nanocrystal compound of claim 1 wherein said one or more linking agents include a glass coating on said one or more semiconductor nanocrystals, and said glass coating is capable of being linked to said one or more affinity molecules.

11. The semiconductor nanocrystal compound of claim 10 wherein said glass coating on said one or more semiconductor nanocrystals comprises a coating of silica glass.

12. The semiconductor nanocrystal compound of claim 1 wherein at least one of said one or more linking agents comprises:

a) a first linking agent linked to at least one of said one or more semiconductor nanocrystals; and

b) a second linking agent:

i) linked to said first linking agent on said one or more semiconductor nanocrystals; and

ii) capable of linking to said one or more affinity molecules.

13. The semiconductor nanocrystal compound of claim 1 comprising two or more semiconductor nanocrystals wherein, in response to exposure to said first energy, said second energy provided by a first of said two or more semiconductor nanocrystals is different than said second energy provided by a second of said two or more semiconductor nanocrystals.

14. A semiconductor nanocrystal compound capable of linking to one or more affinity molecules and capable of, in response to exposure to a first energy, providing a second energy, said semiconductor nanocrystal compound comprising:

a) one or more semiconductor nanocrystals, each capable of, in response to exposure to said first energy, providing said second energy; and

b) one or more first linking agents to which said one or more semiconductor nanocrystals are linked, each of said one or more first linking agents capable of linking to:

i) one or more second linking agents; or

ii) one or more affinity molecules.

15. The semiconductor nanocrystal compound of claim 14 wherein at least one of said one or more first linking agents comprises a three-dimensional shaped structure capable of having linked thereto said one or more semiconductor nanocrystals.

16. The semiconductor nanocrystal compound of claim 15 wherein said three-dimensional shaped structure is capable of being linked, by embedding, to said one or more semiconductor nanocrystals.

17. The semiconductor nanocrystal compound of claim 15 wherein said three-dimensional shaped structure is capable of being linked, by adherence, to said one or more semiconductor nanocrystals.

18. The semiconductor nanocrystal compound of claim 15 wherein said three-dimensional shaped structure further comprises one or more organic materials.

19. The semiconductor nanocrystal compound of claim 15 wherein said three-dimensional shaped structure further comprises one or more inorganic materials.

20. The semiconductor nanocrystal compound of claim 15 wherein said three-dimensional shaped structure comprises a porous solid structure which encapsulates said one or more semiconductor nanocrystals.

21. The semiconductor nanocrystal compound of claim 15 wherein said three-dimensional shaped structure comprises a non-porous solid structure which encapsulates said one or more semiconductor nanocrystals.

22. The semiconductor nanocrystal compound of claim 15 wherein said three-dimensional shaped structure comprises a hollow structure which encapsulates said one or more semiconductor nanocrystals.

23. The semiconductor nanocrystal compound of claim 15 wherein said three-dimensional shaped structure comprises a layered structure having two or more layers.

24. The semiconductor nanocrystal compound of claim 15 wherein said three-dimensional shaped structure comprises a medium transparent to:

i) said first energy to which said one or more semiconductor nanocrystals is exposed; and

ii) said second energy provided by said semiconductor nanocrystals in response to said exposure to said first energy.

25. The semiconductor nanocrystal compound of claim 15 wherein said three-dimensional shaped structure comprises a medium:

i) capable of transferring said first energy to said one or more semiconductor nanocrystals; and

ii) transparent to said second energy provided by said semiconductor nanocrystals in response to said exposure to said first energy.

26. A semiconductor nanocrystal compound capable of linking to one or more affinity molecules and capable of emitting electromagnetic radiation in a narrow wavelength band when exposed to radiation comprising:

a) one or more semiconductor nanocrystals, each capable of emitting electromagnetic radiation in a narrow wavelength band when exposed to radiation; and

b) one or more linking agents, each of said one or more linking agents linked to one or more of said semiconductor nanocrystals.

27. A semiconductor nanocrystal probe capable of, in response to a first energy, providing a second energy, comprising:

a) one or more semiconductor nanocrystal compounds; and

b) one or more affinity molecules linked to said one or more semiconductor nanocrystal compounds.

28. The semiconductor nanocrystal probe of claim 27 wherein said probe is capable of bonding with one or more detectable substances.

29. A semiconductor nanocrystal probe capable of bonding with one or more detectable substances and capable of, in response to exposure to a first energy, providing a second energy, said semiconductor nanocrystal probe comprising:

a) one or more semiconductor nanocrystals, each capable of, in response to exposure to said first energy, providing said second energy;

b) one or more first linking agents, to which said one or more semiconductor nanocrystals are linked, each of said one or more first linking agents capable of linking to:

i) one or more second linking agents; or

ii) one or more affinity molecules; and

c) one or more affinity molecules linked either to said one or more second linking agents or to said one or more first linking agents, each of said one or more affinity molecules capable of selectively bonding to said one or more detectable substances.

30. The semiconductor nanocrystal probe of claim 29 wherein said one or more semiconductor nanocrystals in said probe are capable of receiving said first energy by fluorescence resonance energy transfer (FRET).

31. The semiconductor nanocrystal probe of claim 29 wherein said one or more semiconductor nanocrystals in said probe are capable of providing said second energy by fluorescence resonance energy transfer (FRET).

32. The semiconductor nanocrystal probe of claim 29 wherein said one or more semiconductor nanocrystals in said probe are capable of receiving said first energy by exposure to radiation.

33. The semiconductor nanocrystal probe of claim 32 wherein each of said one or more semiconductor nanocrystals is capable of absorbing said radiation over a wide bandwidth.

34. The semiconductor nanocrystal probe of claim 29 wherein said second energy results from diffraction and/or scattering of said first energy by at least one of said one or more semiconductor nanocrystals.

35. The semiconductor nanocrystal probe of claim 29 wherein said second energy results from absorption of said first energy by at least one of said one or more semiconductor nanocrystals.

36. The semiconductor nanocrystal probe of claim 29 wherein said semiconductor nanocrystal probe is capable of transferring said second energy from said semiconductor nanocrystal probe to one or more first proximal structures.

37. The semiconductor nanocrystal probe of claim 29 wherein said one or more semiconductor nanocrystals in said probe are capable of providing said second energy as electromagnetic radiation emitted by said one or more semiconductor nanocrystals.

38. The semiconductor nanocrystal probe of claim 29 wherein said one or more first linking agents include a glass coating on said one or more semiconductor nanocrystals, and said glass coating is capable of being linked to:

i) said one or more second linking agents; or

ii) said one or more affinity molecules.

39. The semiconductor nanocrystal probe of claim 38 wherein said glass coating on said one or more semiconductor nanocrystals comprises a coating of silica glass.

40. The semiconductor nanocrystal probe of claim 29 wherein said one or more semiconductor nanocrystals comprise two or more semiconductor nanocrystals wherein, in response to exposure to said first energy, said second energy provided by a first of said two or more semiconductor nanocrystals is different than said second energy provided by a second of said two or more semiconductor nanocrystals.

41. The semiconductor nanocrystal probe of claim 40 wherein said two or more semiconductor nanocrystals comprise three or more semiconductor nanocrystals wherein, in response to exposure to said first energy, said second energy provided by a third of said three or more semiconductor nanocrystals is different than said second energies respectively provided by said first and said second of said three or more semiconductor nanocrystals.

42. The semiconductor nanocrystal probe of claim 29 wherein said one or more semiconductor nanocrystals comprise two or more semiconductor nanocrystals wherein, in response to exposure to said first energy, said second energy provided by a first of said two or more semiconductor nanocrystals is the same as said second energy provided by a second of said two or more semiconductor nanocrystals.

43. The semiconductor nanocrystal probe of claim 42 wherein said two or more semiconductor nanocrystals comprise three or more semiconductor nanocrystals wherein, in response to exposure to said first energy, said second energy provided by a third of said three or more semiconductor nanocrystals is different than said second energies respectively provided by said first and said second of said three or more semiconductor nanocrystals.

44. The semiconductor nanocrystal probe of claim 37 wherein said one or more semiconductor nanocrystals comprise two or more semiconductor nanocrystals wherein, in response to exposure to said first energy, said electromagnetic radiation emitted by a first of said two or more semiconductor nanocrystals is different than said electromagnetic radiation emitted by a second of said two or more semiconductor nanocrystals.

45. The semiconductor nanocrystal probe of claim 44 wherein said two or more semiconductor nanocrystals comprise three or more semiconductor nanocrystals wherein, in response to exposure to said first energy, said electromagnetic radiation emitted by a third of said three or more semiconductor nanocrystals is different than said electromagnetic radiation respectively emitted by said first and said second of said three or more semiconductor nanocrystals.

46. The semiconductor nanocrystal probe of claim 37 wherein said one or more semiconductor nanocrystals comprise two or more semiconductor nanocrystals wherein, in response to exposure to said first energy, said electromagnetic radiation emitted by a first of said two or more semiconductor nanocrystals is the same as said electromagnetic radiation emitted by a second of said two or more semiconductor nanocrystals.

47. The semiconductor nanocrystal probe of claim 46 wherein said two or more semiconductor nanocrystals comprise three or more semiconductor nanocrystals wherein, in response to exposure to said first energy, said electromagnetic radiation emitted by a third of said three or more semiconductor nanocrystals is different than said electromagnetic radiation respectively emitted by said first and said second of said three or more semiconductor nanocrystals.

48. The semiconductor nanocrystal probe of claim 29 wherein said semiconductor nanocrystal probe is capable of treating a biological material to determine the presence of said one or more detectable substances.

49. The semiconductor nanocrystal probe of claim 29 wherein said semiconductor nanocrystal probe is capable of treating an organic material to determine the presence of said one or more detectable substances.

50. The semiconductor nanocrystal probe of claim 29 wherein said semiconductor nanocrystal probe is capable of treating an inorganic material to determine the presence of said one or more detectable substances.

51. The semiconductor nanocrystal probe of claim 29 wherein said semiconductor nanocrystal probe is capable of being exposed to elevated temperatures.

52. The semiconductor nanocrystal probe of claim 29 wherein said semiconductor nanocrystal probe is capable of being exposed to temperatures up to about 150°C.

53. The semiconductor nanocrystal probe of claim 29 wherein said semiconductor nanocrystal probe is capable of being exposed to temperatures up to about 100°C.

54. The semiconductor nanocrystal probe of claim 29 wherein said one or more affinity molecules are capable of being modified by one or more synthetic steps to form a modified semiconductor nanocrystal probe.

55. The modified semiconductor nanocrystal probe of claim 54 wherein said one or more affinity molecules comprise one or more strands of nucleic acid.

56. The modified semiconductor nanocrystal probe of claim 55 wherein said one or more strands of nucleic acid have been modified by nucleic acid synthesis to form said modified semiconductor nanocrystal probe.

57. The modified semiconductor nanocrystal probe of claim 56 wherein said modified semiconductor nanocrystal probe is, prior to said nucleic acid synthesis step, exposed to an elevated temperature sufficient to cause said one or more strands of nucleic acid to separate.

58. The modified semiconductor nanocrystal probe of claim 57 wherein said one or more strands of nucleic acid have been modified by a polymerase chain reaction.

59. The semiconductor nanocrystal probe of claim 29 wherein at least one of said one or more semiconductor nanocrystals comprise an alloy comprising two or more semiconductors selected from the group consisting of Group III-V compounds, Group II-VI compounds, Group IV elements, and combinations of same.

60. The semiconductor nanocrystal probe of claim 29 wherein at least one of said one or more semiconductor nanocrystals comprise:

a) a core; and

b) one or more shells, concentrically disposed around the core.

61. The semiconductor nanocrystal probe of claim 29 wherein said one or more affinity molecules comprise one or more first protein molecules, and said one or more detectable substances comprise one or more second protein molecules to which said one or more first protein molecules bond.

62. The semiconductor nanocrystal probe of claim 29 wherein said one or more affinity molecules comprise one or more first small molecules, and said one or more detectable substances comprise one or more second small molecules to which said one or more first small molecules bond.

63. The semiconductor nanocrystal probe of claim 29 wherein said one or more affinity molecules comprise one or more protein molecules, and said one or more detectable substances comprise one or more small molecules to which said one or more protein molecules bond.

64. The semiconductor nanocrystal probe of claim 29 wherein said one or more affinity molecules comprise one or more small molecules, and said one or more detectable substances comprise one or more protein molecules to which said one or more small molecules bond.

65. A semiconductor nanocrystal probe capable of bonding with one or more detectable substances and capable of providing one or more detectable signals in response to exposure to radiation comprising:

a) one or more semiconductor nanocrystals, each capable of providing a detectable signal in response to exposure to radiation;

b) one or more first linking agents, each of said one or more first linking agents having a first portion linked to at least one of said one or more semiconductor nanocrystals, and each of said one or more first linking agents having a second portion capable of linking to either one or more second linking agents or to one or more affinity molecules; and

c) one or more affinity molecules linked either to said second linking agent or to said second portion of said one or more first linking agents, each of said one or more affinity molecules capable of selectively bonding to said one or more detectable substances.

66. The semiconductor nanocrystal probe of claim 65 wherein said one or more detectable signals provided by said one or more semiconductor nanocrystals in response to said exposure to radiation comprises electromagnetic radiation emitted in a narrow wavelength band.

67. A semiconductor nanocrystal probe capable of bonding with one or more detectable substances and capable of, in response to exposure to a first energy, providing a second energy, comprising:

a) one or more semiconductor nanocrystals, each capable of, in response to exposure to said first energy, providing said second energy;

b) one or more first linking agents, at least one of said one or more first linking agents comprising a three-dimensional shaped structure capable of having linked thereto said one or more semiconductor nanocrystals, each of said one or more first linking agents capable of linking to:

i) one or more second linking agents; or

ii) one or more affinity molecules; and

c) one or more affinity molecules linked either to said one or more second linking agents or to said one or more first linking agents, each of said one or more affinity molecules capable of selectively bonding to said one or more detectable substances.

68. The semiconductor nanocrystal probe of claim 67 wherein said three-dimensional shaped structure is capable of being linked, by covalently bonding, to said one or more semiconductor nanocrystals.

69. The semiconductor nanocrystal probe of claim 67 wherein said three-dimensional shaped structure is capable of being linked, by adherence, to said one or more semiconductor nanocrystals.

70. The semiconductor nanocrystal probe of claim 67 wherein said three-dimensional shaped structure is capable of being linked, by embedding, to said one or more semiconductor nanocrystals.

71. The semiconductor nanocrystal probe of claim 67 wherein said three-dimensional shaped structure further comprises one or more organic materials.

72. The semiconductor nanocrystal probe of claim 67 wherein said three-dimensional shaped structure further comprises one or more inorganic materials.

73. The semiconductor nanocrystal probe of claim 67 wherein said three-dimensional shaped structure comprises a porous solid structure which encapsulates said one or more semiconductor nanocrystals.

74. The semiconductor nanocrystal probe of claim 67 wherein said three-dimensional shaped structure comprises a non-porous solid structure which encapsulates said one or more semiconductor nanocrystals.

75. The semiconductor nanocrystal probe of claim 67 wherein said three-dimensional shaped structure comprises a hollow structure which encapsulates said one or more semiconductor nanocrystals.

76. The semiconductor nanocrystal probe of claim 67 wherein said three-dimensional shaped structure comprises a spherically shaped structure.

77. The semiconductor nanocrystal probe of claim 67 wherein said three-dimensional shaped structure comprises two or more substructures wherein each substructure comprises one or more identical semiconductor nanocrystals.

78. The semiconductor nanocrystal probe of claim 77 wherein said two or more substructures each comprise a one layer in a layered structure.

79. The semiconductor nanocrystal probe of claim 67 wherein said three-dimensional shaped structure comprises a medium transparent to:

i) said first energy to which said one or more semiconductor nanocrystals is exposed; and

ii) said second energy provided by said semiconductor nanocrystals in response to said exposure to said first energy.

80. The semiconductor nanocrystal probe of claim 67 wherein said three-dimensional shaped structure comprises a medium:

i) capable of transferring said first energy to said one or more semiconductor nanocrystals; and

ii) transparent to said second energy provided by said semiconductor nanocrystals in response to said exposure to said first energy.

81. The semiconductor nanocrystal probe of claim 67 wherein each of said one or more affinity molecules comprises a molecule of one or more strands of nucleic acid, and each of said one or more detectable substances comprises a molecule of one or more strands of nucleic acid with which said probe bonds.

82. A process for forming a semiconductor nanocrystal compound capable of linking to one or more affinity molecules and capable of, in response to exposure to a first energy, providing a second energy, said semiconductor nanocrystal compound, said process comprising linking together:

a) one or more semiconductor nanocrystals, each capable of, in response to exposure to said first energy, providing said second energy; and

b) one or more linking agents.

83. The process for forming a semiconductor nanocrystal compound of claim 82 including the steps of:

a) linking said one or more semiconductor nanocrystals to one or more first linking agents; and

b) linking said one or more first linking agents to one or more second linking agents capable of linking to said one or more affinity molecules.

84. The process for forming a semiconductor nanocrystal compound of claim 82 which further comprises the steps of:

a) forming a glass coating on said one or more semiconductor nanocrystals; and

b) treating said glass coating with one or more linking agents capable of linking to said glass coating and also capable of linking to said one or more affinity molecules.

85. The process for forming a semiconductor nanocrystal compound of claim 82 which further comprises the steps of:

a) forming a glass coating, as a first linking agent, on said one or more semiconductor nanocrystals; and

b) treating said glass coating with one or more second linking agents capable of linking to said glass coating and also capable of linking to said one or more affinity molecules.

86. The process for forming a semiconductor nanocrystal compound of claim 82 wherein said step of linking said one or more semiconductor nanocrystals to said one or more first linking agents further comprises linking said one or more semiconductor nanocrystals to one or more three-dimensional shaped structures comprising said one or more first linking agents.

87. A process for forming a semiconductor nanocrystal probe capable of, in response to a first energy, providing a second energy, said process comprising linking together:

a) one or more semiconductor nanocrystal compounds; and

b) one or more affinity molecules.

88. A process for forming a semiconductor nanocrystal probe capable of bonding with one or more detectable substances and capable of, in response to exposure to a first energy, providing a second energy, said process comprising the steps of:

a) linking one or more first linking agents with one or more semiconductor nanocrystals, said semiconductor nanocrystals each capable of, in response to exposure to said first energy, providing said second energy; and

b) linking said one or more first linking agents to either:

i) one or more second linking agents; or

ii) one or more affinity molecules capable of selectively bonding to said one or more detectable substances; and

c) linking said one or more affinity molecules to said one or more second linking agents when said one or more first linking agents are linked to said one or more second linking agents.

89. The process for forming a semiconductor nanocrystal probe of claim 88 wherein said step of linking together said one or more semiconductor nanocrystals and said one or more first linking agents is carried out prior to said steps of:

a) linking said one or more first linking agents to either:

i) said one or more second linking agents; or

ii) said one or more affinity molecules capable of selectively bonding to said one or more detectable substances; and

b) linking said one or more affinity molecules to said one or more second linking agents when said one or more first linking agents are linked to said one or more second linking agents.

90. The process for forming a semiconductor nanocrystal probe of claim 88 wherein said steps of:

a) linking said one or more first linking agents to either:

i) said one or more second linking agents; or

ii) said one or more affinity molecules capable of selectively bonding to said one or more detectable substances; and

b) linking said one or more affinity molecules to said one or more second linking agents when said one or more first linking agents are linked to said one or more second linking agents;

are carried out prior to said step of linking together said one or more semiconductor nanocrystals and said one or more first linking agents.

91. The process for forming a semiconductor nanocrystal probe of claim 88 which further comprises the steps of:

a) forming a glass coating, as a first linking agent, on said one or more semiconductor nanocrystals; and

b) treating said glass coating with either:

i) one or more of said second linking agents which are capable of linking to said glass coating; or

ii) said one or more affinity molecules.

92. The process for forming a semiconductor nanocrystal probe of claim 88 wherein said step of linking said one or more semiconductor nanocrystals to said one or more first linking agents further comprises linking said one or more semiconductor nanocrystals to one or more three-dimensional shaped structures comprising said one or more first linking agents.

93. The process for forming a semiconductor nanocrystal probe of claim 92 wherein said three-dimensional shaped structure is formed by forming a layered structure having two or more layers.

94. The process for forming a semiconductor nanocrystal probe of claim 88 wherein at least one of said one or more affinity molecules comprises an affinity molecule capable of being treated in a further step to form a modified semiconductor nanocrystal probe.

95. The process for forming a modified semiconductor nanocrystal probe of claim 94 wherein said step of linking said one or more affinity molecules to either one or more first linking agents or one or more second linking agents further comprises linking said first or second linking agents to one or more strands of nucleic acid which comprise said one or more affinity molecules.

96. The process for forming a modified semiconductor nanocrystal probe of claim 95 comprising the further step of modifying said one or more strands of nucleic acid by nucleic acid synthesis to form said modified semiconductor nanocrystal probe.

97. The process for forming a modified semiconductor nanocrystal probe of claim 96 wherein:

(a) each of said one or more strands of nucleic acid comprises from 1 to about 50 nucleic acid monomers; and

(b) said nucleic acid synthesis comprises the addition of from 1 to about 500,000 nucleic acid monomers to said one or more strands of nucleic acid.

98. The process for forming a modified semiconductor nanocrystal probe of claim 96 wherein said step of modifying said one or more strands of nucleic acid by said nucleic acid synthesis further includes the step of exposing said semiconductor nanocrystal probe to an elevated temperature sufficient to cause said one or more strands of said nucleic acid to separate.

99. The process for forming a modified semiconductor nanocrystal probe of claim 98 wherein said step of modifying said one or more strands of nucleic acid by nucleic acid synthesis further comprises modifying said one or more strands of nucleic acid by a polymerase chain reaction.

100. In a process wherein a precursor semiconductor nanocrystal probe has already been formed by linking one or more semiconductor nanocrystals with one or more linking agents, and linking said one or more linking agents with one or more affinity molecules comprising one or more nucleic acid monomers, the further step which comprises subjecting said precursor probe to nucleic acid synthesis to form a modified semiconductor nanocrystal probe.

101. A process for treating a material by introducing one or more semiconductor nanocrystal probes into said material which comprises:

a) contacting said material with one or more semiconductor nanocrystal probes, said one or more semiconductor nanocrystal probes each comprising:

i) one or more semiconductor nanocrystals, each capable of, in response to exposure to a first energy, providing a second energy;

ii) one or more first linking agents, to which said one or more semiconductor nanocrystals are linked, each of said one or more first linking agents capable of linking to:

1) one or more second linking agents; or

2) one or more affinity molecules; and

iii) one or more affinity molecules linked either to said one or more second linking agents or to said one or more first linking agents;

b) exposing said one or more semiconductor nanocrystal probes in said material to said first energy whereby said second energy is provided by said one or more semiconductor nanocrystals in said one or more semiconductor nanocrystal probes.

102. The process for treating a material of claim 101 wherein said one or more semiconductor nanocrystal probes are capable of bonding to one or more detectable substances in said material, and said second energy provided by said one or more semiconductor nanocrystal probes is indicative of the presence of said one or more detectable substances, in said material, bonded to said one or more semiconductor nanocrystal probes.

103. The process for treating a material of claim 101 wherein said one or more semiconductor nanocrystal probes are capable of transferring said second energy to one or more first proximal structures; and said process includes the further step of transferring said second energy from said one or more semiconductor nanocrystal probes to said one or more first proximal structures.

104. The process for treating a material of claim 103 comprising the further step of detecting a detectable signal provided by said one or more first proximal structures in response to said second energy transferred from said one or more semiconductor nanocrystal probes.

105. The process for treating a material of claim 104 wherein said one or more semiconductor nanocrystal probes transfer said second energy to said one or more first proximal structures by way of a non-radiative pathway.

106. The process for treating a material of claim 103 wherein at least one of said one or more first proximal structures undergoes a chemical change in response to said second energy transferred from said one or more semiconductor nanocrystal probes to said one or more first proximal structures.

107. The process for treating a material of claim 106 wherein said chemical change comprises a photolytic cleavage of one or more covalent bonds.

108. The process for treating a material of claim 106 wherein said first energy to which said semiconductor nanocrystal probe is exposed comprises radiation having a first wavelength, and said second energy transferred from said one or more semiconductor nanocrystal probes to said one or more first proximal structures comprises radiation having a second wavelength, wherein said second wavelength is shorter than said first wavelength.

109. The process for treating a material of claim 108 whereby said first energy having said first wavelength is converted to said second energy having said second shorter wavelength through a process of two-photon absorption.

110. The process for treating a material of claim 108 wherein said first energy to which said semiconductor nanocrystal probe is exposed comprises infrared radiation, and wherein said second energy transferred from said one or more semiconductor nanocrystal probes to said one or more first proximal structures comprises ultraviolet radiation.

111. The process for treating a material of claim 103 wherein at least one of said one or more first proximal structures undergoes conformational changes in response to said second energy transferred from said one or more semiconductor nanocrystal probes to said one or more first proximal structures.

112. The process for treating a material of claim 103 wherein said second energy transferred from said one or more semiconductor nanocrystal probes to said one or more first proximal structures is heat energy.

113. The process for treating a material of claim 103 wherein said second energy transferred from said one or more semiconductor nanocrystal probes to said one or more first proximal structures, is transferred from said one or more first proximal structures to one or more second proximal structures.

114. A process for treating a material using one or more semiconductor nanocrystal probes to determine the presence of one or more detectable substances in said material which comprises:

a) contacting said material with one or more semiconductor nanocrystal probes, said one or more semiconductor nanocrystal probes each comprising:

i) one or more semiconductor nanocrystals, each capable of, in response to exposure to a first energy, providing a second energy;

ii) one or more first linking agents, to which said one or more semiconductor nanocrystals are linked, each of said one or more first linking agents capable of linking to:

1) one or more second linking agents; or

2) one or more affinity molecules; and

iii) one or more affinity molecules linked either to said one or more second linking agents or to said one or more first linking agents, each of said one or more affinity molecules capable of selectively bonding to said one or more detectable substances;

b) exposing said one or more semiconductor nanocrystal probes to said first energy; and

c) detecting said second energy provided by said one or more semiconductor nanocrystals in said one or more semiconductor nanocrystal probes bonded to said one or more detectable substances in said material.

115. The process for treating a material of claim 114 further including the optional step of removing from said material any of said one or more semiconductor nanocrystal probes not bonded to said one or more detectable substances in said material prior to said step of detecting said second energy provided by any of said one or more probes bonded to said one or more detectable substances.

116. The process for treating a material of claim 115 wherein said one or more detectable substances, the presence of which is being determined, comprise a biological material.

117. The process for treating a material of claim 115 wherein said one or more detectable substances are present on the surface or interior of biological cells.

118. The process for treating a material of claim 117 wherein two or more of said semiconductor nanocrystal probes are bonded to said one or more detectable substances in said material, each of said two or more probes capable of providing a second energy comprising a detectable signal in response to exposure to said first energy, and at least two of said detectable signals from said two or more probes are simultaneously detected.

119. The process for treating a material of claim 117 wherein said material is flowed through one or more compartments transparent to:

a) said first energy to which said material is exposed; and

b) said second energy provided by said one or more semiconductor nanocrystal probes in response to exposure to said first energy.

120. The process for treating a material of claim 119 wherein two or more of said semiconductor nanocrystal probes are bonded to said one or more detectable substances in said material, each of said two or more probes capable of providing a second energy comprising a detectable signal in response to exposure to said first energy, and at least two of said detectable signals from said two or more probes are consecutively detected.

121. The process for treating a material of claim 119 wherein two or more of said semiconductor nanocrystal probes are bonded to said one or more detectable substances in said material, each of said two or more probes capable of providing a second energy comprising a detectable signal in response to exposure to said first energy, and at least two of said detectable signals from said two or more probes are simultaneously detected.

122. The process for treating a material of claim 115 wherein said one or more affinity molecules has been modified with an organic substance prior to said treating of said material.

123. The process for treating a material of claim 115 wherein said one or more affinity molecules comprise one or more strands of nucleic acid, and said one or more detectable substances in said material also comprise one or more strands of nucleic acid; and said step of contacting said material with said one or more probes causes said one or more strands of nucleic acid of said one or more probes to bond to said one or more strands of nucleic acid in said material by nucleic acid hybridization.

124. The process for treating a material of claim 115 wherein said first energy is transferred from one or more proximal sources to said one or more semiconductor nanocrystal probes.

125. The process for treating a material of claim 124 wherein said one or more proximal sources transfer said first energy to said one or more semiconductor nanocrystal probes by way of a radiative pathway.

126. The process for treating a material of claim 124 wherein said one or more proximal sources transfer said first energy to said one or more semiconductor nanocrystal probes by way of a non-radiative pathway.

127. The process for treating a material of claim 124 wherein said second energy indicates the concentration of at least one of said one or more proximal sources.

128. The process for treating a material of claim 124 wherein said second energy indicates the distance between at least one of said one or more proximal sources and at least one of said one or more semiconductor nanocrystal probes.

129. The process for treating a material of claim 124 wherein said second energy indicates an event which causes said one or more proximal sources to be spatially proximal to said one or more semiconductor nanocrystal probes.

130. The process for treating a material of claim 124 wherein said one or more proximal sources undergo nuclear decay; and said first energy to which said one or more semiconductor nanocrystals are exposed, comprises radiation originating from said one or more proximal sources.

131. The process for treating a material of claim 124 wherein said first energy to which said one or more semiconductor nanocrystals are exposed, is transmitted through said one or more proximal sources from an energy source separate from said one or more proximal sources.

132. The process for treating a material of claim 115 wherein at least one of said one or more first linking agents comprises a three dimensional structure.

133. The process for treating a material of claim 132 wherein said three dimensional structure is linked to two or more of said semiconductor nanocrystals.

134. The process for treating a material of claim 133 wherein said second energy provided by said two or more semiconductor nanocrystals linked to said three dimensional structure comprises one or more detectable signals.

135. The process for treating a material of claim 115 wherein said one or more semiconductor nanocrystal probes comprise two or more semiconductor nanocrystal probes; and wherein, in response to exposure to said first energy, said second energy provided by a first of said two or more semiconductor nanocrystal probes is different than said second energy provided by a second of said two or more semiconductor nanocrystal probes.

136. The process for treating a material of claim 135 wherein said two or more semiconductor nanocrystal probes comprise three or more semiconductor nanocrystal probes wherein, in response to exposure to said first energy, said second energy provided by a third of said three or more semiconductor nanocrystal probes is different than said second energies respectively provided by said first and said second of said three or more semiconductor nanocrystal probes.

137. The process for treating a material of claim 115 wherein said one or more semiconductor nanocrystal probes comprise two or more semiconductor nanocrystal probes wherein, in response to exposure to said first energy, said second energy provided by a first of said two or more semiconductor nanocrystal probes is the same as said second energy provided by a second of said two or more semiconductor nanocrystal probes.

138. The process for treating a material of claim 137 wherein said two or more semiconductor nanocrystal probes comprise three or more semiconductor nanocrystal probes wherein, in response to exposure to said first energy, said second energy provided by a third of said three or more semiconductor nanocrystal probes is different than said second energies respectively provided by said first and said second of said three or more semiconductor nanocrystal probes.

139. A process for treating a material to determine the presence of one or more detectable substances in said material which comprises:

a) contacting said material with one or more semiconductor nanocrystal probes capable of bonding with said one or more detectable substances, if present, in said material, and capable of providing one or more detectable signals in response to exposure to energy, said one or more semiconductor nanocrystal probes comprising:

i) one or more semiconductor nanocrystals each capable of providing a detectable signal in response to exposure to energy;

ii) one or more first linking agents, to which said one or more semiconductor nanocrystals are linked, each of said one or more first linking agents capable of linking to:

1) one or more second linking agents; or

2) one or more affinity molecules; and

iii) one or more affinity molecules linked either to said one or more second linking agents or to said one or more first linking agents, each of said one or more affinity molecules capable of selectively bonding to said one or more detectable substances;

b) optionally removing, from said material, any of said semiconductor nanocrystal probes not bonded to said one or more detectable substances; and

c) exposing said material to energy capable of causing said one or more semiconductor nanocrystals to provide one or more detectable signals in response to said energy, indicative of the presence of said one or more detectable substances in said material; and

d) detecting said one or more detectable signals provided by said one or more semiconductor nanocrystals in said one or more semiconductor nanocrystal probes.

140. The process for treating a material of claim 139 wherein said step of exposing said material to energy capable of causing said one or more semiconductor nanocrystals to provide one or more detectable signals further comprises exposing said material to a source of radiation.

141. The process for treating a material of claim 140 wherein said source of radiation comprises a source of electromagnetic radiation.

142. The process for treating a material of claim 141 wherein said source of electromagnetic radiation is capable of emitting electromagnetic radiation of a broad or narrow wavelength band.

143. The process for treating a material of claim 142 wherein said broad or narrow wavelength band of electromagnetic radiation comprises electromagnetic radiation selected from the group consisting of visible light, ultraviolet light, x-rays, and infrared light.

144. The process for treating a material of claim 140 wherein said source of radiation comprises a particle beam.

145. The process for treating a material of claim 139 wherein said one or more detectable signals result from diffraction and/or scattering of said energy by at least one of said one or more semiconductor nanocrystals.

146. The process for treating a material of claim 145 wherein said step of exposing said material to energy capable of providing said one or more detectable signals from diffraction and/or scattering of said energy further comprises exposing said material to a particle beam.

147. The process for treating a material of claim 145 wherein:

a) said step of exposing said materials to energy capable of causing said one or more semiconductor nanocrystals to scatter or diffract energy; and

b) said step of detecting said one or more detectable signals resulting from said scattering or diffraction of energy;

are both carried out using a transmission electron microscope.

148. The process for treating a material of claim 145 wherein:

a) said step of exposing said materials to energy capable of causing said one or more semiconductor nanocrystals to scatter or diffract energy; and

b) said step of detecting said one or more detectable signals resulting from said scattering or diffraction of energy;

are both carried out using a scanning electron microscope.

149. The process for treating a material of claim 139 wherein said one or more detectable signals result from absorption of said energy by at least one of said one or more semiconductor nanocrystals.

150. The process for treating a material of claim 139 wherein said one or more semiconductor nanocrystals in said one or more probes are capable of providing said one or more detectable signals as electromagnetic radiation emitted by said one or more semiconductor nanocrystals.

151. The process for treating a material of claim 150 wherein said one or more semiconductor nanocrystals are capable of emitting electromagnetic radiation in a narrow wavelength band when exposed to said energy.

152. The process for treating a material of claim 150 wherein said electromagnetic radiation emitted by said one or more semiconductor nanocrystals comprises visible light.

153. The process for treating a material of claim 150 wherein said electromagnetic radiation emitted by said one or more semiconductor nanocrystals comprises ultraviolet light.

154. The process for treating a material of claim 150 wherein said electromagnetic radiation emitted by said one or more semiconductor nanocrystals comprises infrared light.

155. The process for treating a material of claim 139 wherein said energy to which said one or more semiconductor nanocrystals are exposed comprises electromagnetic radiation of a broad wavelength band; and said one or more detectable signals, provided by said one or more semiconductor nanocrystals in response to said exposure, comprise electromagnetic radiation emitted in a narrow wavelength band.